UNITED STATES DEPARTMENT OF AGRICULTURE

# FOREST SERVICE



A N N U A L  R E P O R T

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN CALIFORNIA

FOR THE CALENDAR YEAR 1962

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# BLISTER RUST CONTROL IN CALIFORNIA - 1962

The white pine blister rust control program in California has three interrelated objectives: indirect control of the disease by means of ribes suppression, direct control through the use of chemical fungicides applied directly to infected trees, and the development of rust-resistant sugar pine hybrids.

At the present time, selected white pine stands in California are protected principally through the suppression of ribes populations. These plants, which are alternate hosts for the disease, are eradicated mainly by hand grubbing; most of the work is performed under contract. A small amount of eradication work is done in lightly populated stands by hired technicians who also conduct various operational surveys.

The use of chemical fungicides to treat infected trees is a recent development, and field testing in California has not yet progressed to the point at which large-scale operational applications are possible.

The development of rust-resistant hybrids is a long-term genetics project being conducted as a part of the California's Region over-all tree improvement program. Over 100 naturally resistant candidates have been located in heavily infected stands. These are being tested for their ability to pass on to their progeny a degree of this resistance.

## BLISTER RUST CONTROL IS A COOPERATIVE UNDERTAKING

The control of white pine blister rust in California involves the cooperation of several State and Federal agencies and numerous representatives of California's forest industry. The cooperators and their principal roles in the program are:

The State of California: Through its continued interest and substantial financial support the State of California makes possible the protection of sugar pine stands on more than 200,000 acres of privately owned forest land. The contribution of private owners plus the Federal appropriation is matched by the State. Where the owner does not contribute financially, but agrees to manage the stand for sugar pine production, the State and Federal Government share the cost of protection.

About 12,000 acres of State forests and parks are included in protection units; here the work is financed entirely by the State. Control operations on State and private lands are carried out by the Forest Service under a cooperative agreement with the State of California. National Forests perform

the work with technical assistance and coordination from the Regional Office of the Forest Service in San Francisco and from the California Division of Forestry. The University of California is also an active participant in the program. Control accomplishments on State and private lands are reported in the accompanying tables under the heading, "Work Done by the State Cooperative Project."

Industry: Individual forest landowners in California may participate directly by entering cooperative agreements under which control operations are carried out. They are encouraged to contribute up to 25 percent of the cost of control.

California's forest industry participates indirectly through the California Forest Pest Control Action Council, which periodically reviews progress of the blister rust control program and makes appropriate recommendations to the State Board of Forestry.

National Park Service: The National Park Service has selected for protection outstanding white pine stands throughout the three National Parks in California. At the present time these units, in which five species of white pine are represented, comprise 163,000 acres. Control work is done by the Parks with the technical assistance of the Forest Service

Forest Service: The Forest Service's main responsibilities in blister rust control is for over-all leadership, technical direction and coordination of control work on lands of all ownerships. This is provided by the Division of Timber Management of the San Francisco Regional Office, and the Pacific Southwest Forest and Range Experiment Station in Berkeley. In addition, ten National Forests have active sugar pine management programs. At present National Forest sugar pine management units include 290,000 acres.

## RIBES ERADICATION AND SURVEYS

The field operations needed to carry out the State Cooperative Project and National Forest Project are identical and frequently involve intermingled lands; for this reason the two projects are conducted as a single integrated operation by individual National Forests. Some ribes eradication work is done by crews from State Conservation Camps.

In 1962, ribes were eradicated from 22,000 acres of Federal and privately owned land, and 136,000 acres were surveyed; no work was needed on State land. Nearly 16,000 acres of the ribes eradication work was done by contractors at an average price of $7.58 per acre. Crews from the Intermountain and Plum Creek State Conservation Camps completed 1,329 acres of initial work on private land. The remaining ribes eradication, mostly maintenance work, was done by hired technicians.

Lassen Volcanic National Park: Work in existing control units is now substantially finished, and the Park is in the process of assessing its over-all blister rust control needs. Many of the present units are on a maintenance basis and will require little if any further attention. A delineation survey will be made to appraise white pine stands not now included in protection units. The Park expects to submit a proposal for protection needs by the spring of 1963.

Yosemite National Park: In 1962, 2,560 additional acres were put on a maintenance basis and 7,588 acres were classified as requiring no further ribes eradication. Ribes eradication was done on 1,384 acres; all of the work was done by skilled technicians. Due to the small amount of area suitable for contracting, the Park has discontinued its contracting program. Future plans call for more emphasis on scouting for blister rust.

## DIRECT CONTROL

The fungicide-testing program was continued in 1962 with particular emphasis on reading the results of the 1959-1961 applications. With the exception of one aerial application of Phytoactin, no new tests were made. Results to date may be summarized as follows:

1. Tests of aerial applications are too recent to allow readings.

2. Of the fungicides tested, none has yet given sufficiently good results to warrant operational use as a basal stem application.

3. Direct treatment of cankers appears to be more successful than indirect treatment, but results are erratic and the use of chemical fungicides has not yet been adopted as a means of direct control in the California Region.

4. Some conventional fungicides have produced results that seem comparable to those of the antibiotics tested.

5. Considerable time seems necessary to get conclusive readings on fungicide tests of this sort. Readings of many of the 1960 and some of the 1959 tests must still be regarded as tentative.

Readings will be taken again on most plots in 1963, including the plots established in 1961.

Spring Aerial Application of Phytoactin: In early June a 20-acre test plot on the Six Rivers National Forest was sprayed by helicopter with Phytoactin L-318. The plot contained both sugar pine and western white pine. Fifty indicator trees of each species were selected for observation.

## RUST-RESISTANT SUGAR PINE

Beginning in 1957 a search for apparently resistant sugar pines was begun in the most active infection centers on the Klamath National Forest where the disease has been epidemic for many years. To date about 100 such candidate trees have been found. Each has been released from competition with surrounding trees and brush, and has been fertilized regularly. Scion wood has been collected from each and grafted onto seedling sugar pines in order to preserve the germ plasm. Carefully controlled cross pollinations between candidates of cone-bearing age were made in 1959. Since it is expected that few of candidates will be capable of passing on their resistance, the main phase of the project is the testing of various crosses to determine which combination yields the greatest resistance. Ultimately, seed orchards of the best candidates will be established.

In 1962, the first cross-pollinated seedlings were given preliminary resistance tests. An outplanting site near Happy Camp was prepared earlier to provide optimum infection conditions. During the summer, 700 of the cross-pollinated seedlings were interplanted with a highly susceptible ribes species. A second testing in 1962 was done at Placerville where a cold storage shed was rigged to furnish ideal temperature and humidity conditions; 800 of the seedlings were artificially inoculated here with spores from ribes leaves collected earlier on the Klamath.

## RUST SPREAD AND INTENSIFICATION IN 1962

There was little spread from pine-to-ribes in the spring of 1962 and ribes-to-pine spread in the fall should be equally light. No new infection centers were reported in either the Sierra Nevada or the Coast Range that would extend the southern limits of rust penetration. Within the present zone of infection, the disease continued to build up rapidly on white pine wherever conditions exist that especially favor its development. Intensification of this type is common in northwestern California. In the southern Cascade and northern Sierra Nevada Ranges heavy infection occurs less frequently. In the central Sierra and the Coast Ranges infection centers become increasingly less severe as well as less frequent from north to south. The southernmost centers yet reported are on Gualala Peak, Mendocino County, and Dodge Ridge, Tuolumne County. There was little pinyon rust noted on ribes in 1962.

TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF DECEMBER 31, 1962

| Ownership | Control Operation | Control Units | | Status of Ribes Eradication | | | |
|---|---|---|---|---|---|---|---|
| | | | | Net Acres by Workings | | | Acres on Maint. |
| | | Total Acres | Acres Unworked | Initial | Reerad. | Maint. Work | |
| WORK DONE BY THE STATE COOPERATIVE PROJECT | | | | | | | |
| PRIVATE LAND | Mendocino (Glenn County) | | | | | | |
| | Klamath (Siskiyou County) | 2,300 | | 2,300 | 3,974 | 2,199 | 2,300 |
| | Shasta-Trinity (Siskiyou and Shasta Counties) | 4,315 | 71 | 4,244 | 5,628 | 120 | 220 |
| | Modoc (Siskiyou and Modoc Counties) | 8,489 | 4,010 | 4,479 | 726 | | 579 |
| | Lassen (Tehama, Butte, Plumas, and Shasta Counties) | 105,126 | 23,114 | 82,012 | 92,435 | 4,034 | 55,244 |
| | Plumas (Plumas, Butte, Yuba, and Sierra Counties) | 24,802 | 2,776 | 22,026 | 43,612 | 40 | 40 |
| | Tahoe (Sierra, Nevada, and Placer Counties) | 1,935 | | 1,935 | 1,664 | | 244 |
| | Eldorado (Eldorado, Placer, and Amador Counties) | 41,798 | 7,646 | 34,152 | 69,005 | 137 | 8,320 |
| | Stanislaus (Calaveras and Tuolumne Counties) | 8,112 | 316 | 7,796 | 19,760 | 91 | 4,181 |
| | Sierra* (Mariposa, Madera, and Fresno Counties) | 14,422 | 1,285 | 13,137 | 12,009 | 66 | 620 |
| | TOTAL | 211,299 | 39,218 | 172,081 | 248,813 | 6,687 | 71,748 |
| STATE LAND | Latour State Forest | 3,109 | 863 | 2,246 | 1,888 | 53 | 1,014 |
| | Blodgett Forest-Univ. of Calif. | 940 | | 940 | 2,859 | | |
| | D. L. Bliss-Emerald Bay State Parks | 2,280 | 40 | 2,240 | 89 | | 1,203 |
| | Calaveras Big Trees State Park | 5,073 | 814 | 4,259 | 10,230 | | 3,061 |
| | Mountain Home State Forest* | 878 | 130 | 748 | 395 | | |
| | TOTAL | 12,280 | 1,847 | 10,433 | 15,461 | 53 | 5,278 |
| TOTAL STATE AND PRIVATE | | 223,579 | 41,065 | 182,514 | 264,274 | 6,740 | 77,026 |
| WORK DONE BY THE FOREST SERVICE | | | | | | | |
| NATIONAL FOREST LAND | Mendocino | 7,850 | 6,290 | 1,560 | 1,080 | | |
| | Klamath | 2,238 | | 2,238 | 2,326 | 775 | 2,238 |
| | Shasta-Trinity | 12,169 | 877 | 11,292 | 7,273 | 105 | 321 |
| | Modoc | | | | | | |
| | Lassen | 41,176 | 22,251 | 18,925 | 15,087 | 725 | 8,068 |
| | Plumas | 69,981 | 20,588 | 49,393 | 69,061 | 990 | 2,066 |
| | Tahoe | 21,581 | 1,871 | 19,710 | 17,514 | | 3,162 |
| | Eldorado | 37,319 | 8,483 | 28,836 | 42,354 | 10 | 4,941 |
| | Stanislaus | 43,965 | 1,272 | 42,693 | 97,298 | 962 | 24,814 |
| | Sierra* | 49,578 | 19,293 | 30,285 | 44,415 | 51 | 500 |
| | Sequoia* | 4,974 | | 4,974 | 3,609 | | 560 |
| | TOTAL | 290,831 | 80,925 | 209,906 | 300,017 | 3,618 | 46,670 |
| WORK DONE BY THE NATIONAL PARK SERVICE | | | | | | | |
| NATIONAL PARK LAND | Lassen Volcanic | 26,784 | 394 | 26,390 | 28,738 | 4,355 | 23,720 |
| | Yosemite | 85,697 | 3,523 | 82,174 | 110,816 | 13,753 | 62,035 |
| | Sequoia-Kings Canyon* | 50,576 | 2,400 | 48,176 | 59,661 | 8,322 | 42,667 |
| | TOTAL | 163,057 | 6,317 | 156,740 | 199,215 | 26,430 | 128,422 |
| ALL WORK DONE IN CALIFORNIA | | | | | | | |
| ALL CONTROL OPERATIONS | | 677,467 | 128,307 | 549,160 | 763,506 | 36,788 | 252,118 |

* Inactive control operations. Data are as of December 31, 1960.

TABLE 2

SUMMARY OF RIBES ERADICATION IN CALIFORNIA - 1962

| Ownership | Control Operation | | Acres Worked | Eradication Man Days | Thousands of Ribes Destroyed | Acres Surveyed | Contract Eradication | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Acres Worked | Average Price Per Acre Paid to Contractor |
| **WORK DONE BY STATE COOPERATIVE PROJECT** | | | | | | | | |
| PRIVATE LAND | Klamath (Siskiyou County) | | 12 | 7 | 1 | | | |
| | Shasta-Trinity (Siskiyou and Shasta Counties) | | 487 | 169 | 38 | 3,420 | 487 | $8.67 |
| | Modoc (Siskiyou and Modoc Counties) | | 737 | 989 | 59 | 1,003 | | |
| | Lassen (Tehama, Butte, Plumas, and Shasta Counties) | | 3,877 | 1,406 | 214 | 20,305 | 1,904 | 6.56 |
| | Plumas (Plumas, Butte, Yuba, and Sierra Counties) | | 1,443 | 622 | 115 | 13,782 | 1,117 | 12.89 |
| | Tahoe (Sierra, Nevada, and Placer Counties) | | 314 | 65 | 173 | 474 | 314 | 5.17 |
| | Eldorado (Eldorado, Placer, and Amador Counties) | | 605 | 187 | 48 | 1,755 | 605 | 6.51 |
| | Stanislaus (Calaveras and Tuolumne Counties) | | 588 | 116 | 38 | 1,717 | 588 | 4.64 |
| | Sierra* (Mariposa, Madera, and Fresno Counties) | | | | | | | |
| STATE LAND | Latour State Forest | | | | | | | |
| | Blodgett Forest-Univ. of Calif. | | | | | | | |
| | D. L. Bliss-Emerald Bay State Parks | | | | | | | |
| | Calaveras Big Trees State Park | | | | | | | |
| | Mountain Home State Forest* | | | | | | | |
| ALL WORK DONE BY THE STATE COOPERATIVE PROJECT | | Initial | 1,925 | 1,714 | 195 | | | |
| | | Reeradication | 4,930 | 1,684 | 468 | | | |
| | | Maintenance | 1,208 | 163 | 23 | | | |
| | | All | 8,063 | 3,561 | 686 | 42,456 | 5,015 | $8.07 |
| **WORK DONE BY THE FOREST SERVICE** | | | | | | | | |
| NATIONAL FOREST LAND | Mendocino | | 353 | 144 | 74 | 422 | | |
| | Klamath | | 10 | 6 | 1 | | | |
| | Shasta-Trinity | | 1,288 | 311 | 91 | 5,431 | 1,234 | 5.28 |
| | Modoc | | | | | | | |
| | Lassen | | 2,964 | 990 | 291 | 12,258 | 2,431 | 8.24 |
| | Plumas | | 2,581 | 1,365 | 520 | 31,190 | 2,091 | 10.89 |
| | Tahoe | | 1,694 | 473 | 554 | 10,113 | 1,683 | 6.89 |
| | Eldorado | | 1,246 | 261 | 110 | 4,639 | 1,246 | 5.79 |
| | Stanislaus | | 1,929 | 381 | 147 | 7,961 | 1,679 | 4.35 |
| | Sierra* | | | | | | | |
| | Sequoia* | | | | | | | |
| ALL WORK DONE BY THE FOREST SERVICE | | Initial | 2,676 | 1,161 | 420 | | | |
| | | Reeradication | 8,924 | 2,687 | 1,359 | | | |
| | | Maintenance | 465 | 83 | 9 | | | |
| | | All | 12,065 | 3,931 | 1,788 | 72,014 | 10,364 | $7.27 |
| **WORK DONE BY THE NATIONAL PARK SERVICE** | | | | | | | | |
| NATIONAL PARK LAND | Lassen Volcanic | | 791 | 194 | 59 | 8,172 | 353 | 9.56 |
| | Yosemite | | 1,384 | 336 | 44 | 13,726 | | |
| | Sequoia-Kings Canyon* | | | | | | | |
| ALL WORK DONE BY THE NATIONAL PARK SERVICE | | Initial | | | | | | |
| | | Reeradication | 807 | 236 | 79 | | | |
| | | Maintenance | 1,368 | 294 | 24 | | | |
| | | All | 2,175 | 530 | 103 | 21,898 | 353 | $9.56 |
| **ALL WORK DONE IN CALIFORNIA** | | | | | | | | |
| ALL OWNERSHIPS ALL AGENCIES | | Initial | 4,601 | 2,875 | 615 | | | |
| | | Reeradication | 14,661 | 4,607 | 1,906 | | | |
| | | Maintenance | 3,041 | 540 | 56 | | | |
| | | All | 22,303 | 8,022 | 2,577 | 136,368 | 15,732 | $7.58 |

* Inactive control units.